

# THE ANNALS

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LVIII.—*The Pectoral and Pelvic Girdles of Murænosaurus plicatus.* By C. W. ANDREWS, F.G.S., Assistant in the British Museum (Natural History).

PHILLIPS, in the 'Geology of Oxford' (p. 313), described under the name *Plesiosaurus plicatus* certain cervical and dorsal vertebræ from the Oxford Clay of Shotover. From the same horizon in the neighbourhood of Peterborough numerous more or less complete skeletons of a species of Plesiosaur have been collected in which the vertebræ are of a similar character. These specimens present a considerable range of variation both in size and in the degree to which fusion of the elements of the vertebræ has taken place; in some the neural arches and cervical ribs are still quite free, in others they are co-ossified with the centra. It was on one of the skeletons in which the latter condition obtains that Professor Seeley founded his description of *Murænosaurus Leedsi*. The genus *Murænosaurus* is distinguished from *Cryptoclidus*, to which the greater number of specimens from this locality are referable, by the enormous length of the neck (about seven times that of the head), caused not only by the much larger number (forty-four) of cervical vertebræ, but also by the greater length of the individual centra. There are also numerous differences in the pectoral girdle and limb-bones which fully establish the right of this type of Plesiosaurian skeleton to generic rank.

With regard to the species there is some difficulty. Mr. Lydekker has included under *Cimoliosaurus plicatus* Phillips's species *Plesiosaurus plicatus*, *P. hexagonalis*, and *P. infra-planus*, as well as Professor Seeley's *Muraenosaurus Leedsi*. For the specimen (Leeds Coll. 28), the limb-girdles of which are figured in the present paper, he has suggested the specific name *Cimoliosaurus durobrivensis*, considering it separable from *C. plicatus* on account of its somewhat shorter cervical vertebræ. Comparison of some six or seven more or less complete sets of cervical vertebræ (including those of the type specimens of *Muraenosaurus Leedsi* and *Cimoliosaurus durobrivensis*) with one another shows that, apart from variations in size and in the extent to which the arches and ribs have fused with the centra, no important differences are to be found. The size and condition of ossification are probably dependent merely on the age and sex of the individual. It is, however, possible that the comparatively small individuals in which fusion between the arches and centra has already occurred may be specifically distinct, in which case the name *Muraenosaurus Leedsi* must be applied to them, the type specimen of that species being of this form. On the other hand, as already remarked, these differences may be merely sexual, and, as Mr. Boulenger has shown in the case of the *Chelonia*\*, the fusion of other elements with the vertebral centra takes place very irregularly, and consequently is of little systematic value. For the present, therefore, it seems best to regard all the specimens possessing cervical vertebræ of the type of *Plesiosaurus plicatus* as belonging to that species.

In the present note specimens of the pectoral and pelvic girdles which have lately been mounted for exhibition at the Natural History Museum are described. These belong to the same individual (R. 2428, Leeds Coll. 28), which is that for which Mr. Lydekker proposed the name *Cimoliosaurus durobrivensis*.

#### *The Pectoral Girdle.* (Fig. 1.)

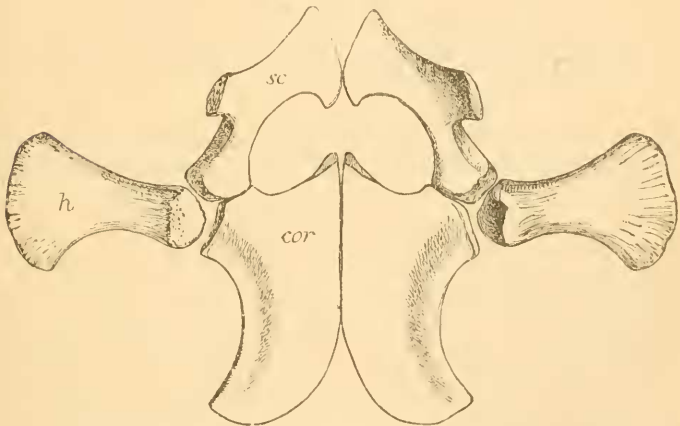
In general form the *scapula* (*sc*) resembles that of *Cryptoclidus*, but differs from it in several points, *e. g.* (1) the posterior border of the dorsal ramus near its upper end bears a sharp crest, apparently for the insertion of muscle; (2) the dorsal ramus widens out much more rapidly towards its base and its anterior edge is thin and sharp; (3) the ventral ramus is considerably wider, and also has a comparatively thin anterior

\* Trans. Zool. Soc. vol. xiii. pt. 8, p. 309.

edge, which bears no tubercle such as occurs in *Cryptoclidus* (see this Magazine, ser. 6, vol. xv. p. 337, fig. 2 A, t). The median portion of the ventral bars had already begun to grow back to form a junction with the anterior prolongations of the coracoids, but were still separated from them by a considerable interval; other pectoral girdles in the collection show this junction. The scapulæ had not yet quite met in median symphysis, and anteriorly were separated from one another by a wide V-shaped interval. In life this space was wholly or partially closed by the clavicular arch, which unfortunately is wanting in this specimen. The scapulæ anteriorly curve inwards and upwards in such a way that, with the clavicles, they formed the anterior wall of the thorax.

The general form of the *coracoids* (*cor*) is shown in the figure (fig. 1). Between the glenoid surfaces the bones are very thick and massive, and unite in a strong median symphysis

Fig. 1.



Pectoral girdle of *Murænosaurus* from above. *sc*, scapula; *cor*, coracoid; *h*, humerus. About  $\frac{1}{10}$  nat. size.

about 5 centim. deep at the thickest part. In this region the visceral surface of the coracoids is concave from side to side, forming an arc of a circle whose radius is about 28 centim. Behind this strong transverse ridge the visceral surface is depressed, owing to the rapid thinning of the bone, which, except near the outer border, is less than a centimetre thick. In this thin posterior region the coracoids meet at an angle of about  $120^\circ$ . The outer concave border is somewhat thickened, but is not produced backwards and outwards into

projecting processes as in the fully ossified coracoid of *Cryptoclidus*. The thin inner posterior portion of the bone is frequently broken away, and the remaining portion, consisting of the thickened anterior and external borders, has then the form shown by Prof. Seeley in his figure of the coracoids of *Muraenosaurus Manselli* \*.

The posterior convex margin in the present specimen bears rough grooved surface for cartilage, showing that growth was still in progress in this direction. Anteriorly the coracoids are prolonged forwards in the middle line in short pointed processes, which extend towards the backward processes of the scapulæ, but do not reach them; both bones, however, bear surfaces for cartilage, and were probably already united by a bar of that substance.

The dimensions of the pectoral girdle are:—

	centim.
Extreme length from anterior end of scapulæ to hinder border of coracoids .....	59
Width across coracoids in a straight line between the hinder edges of the glenoid facets.....	38
Extreme length of coracoids .....	40
Width of coracoids at narrowest point.....	27

The humerus (*h*) figured measures about 31 centim. long; the smallest circumference of its shaft is 21 centim., and the width of its expanded distal extremity is 19 centim.

#### *The Pelvic Girdle.* (Figs. 2, 3.)

The pelvis represented in figs. 2 and 3 gives a clearer idea of the structure of that portion of the Plesiosaurian skeleton than any other specimen or figure with which I am acquainted.

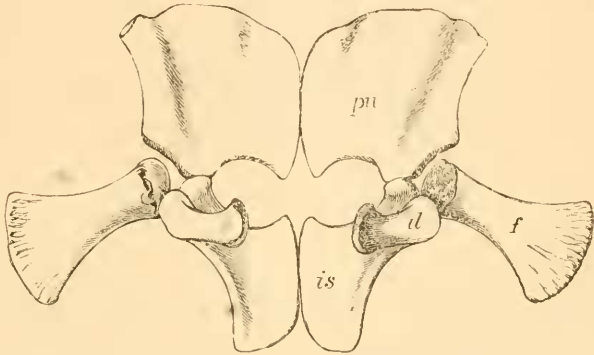
The *pubis* (*pu*) is a broad nearly flat plate of bone, very thin except near the median border and the articular surfaces for the ischium and femur; the posterior margin is also somewhat thickened. The width of the bone from the antero-external to the antero-internal angle is 28 centim., the length from the ischial surface to the anterior border 25.5 centim. The length of the acetabular surface is about 8 and of the ischial surface 4 centim. In the specimen figured the left pubis has been restored in plaster. The two pubes seem to have made an angle of about 120° with one another; they were still separated in the middle line by a pad of cartilage, which was widest in front and behind; whether the posterior portion of this cartilage extended back to join that lying between the

\* Quart. Journ. Geol. Soc. vol. xxx. (1874) p. 437, fig. 2.

ischia, thus enclosing an *obturator foramen* on either side, cannot be determined, but it probably did so.

The *ischia* (*is*) are hatchet-shaped bones, the upper thickened ends of which bear three articular surfaces—an anterior one

Fig. 2.



Pelvic girdle of *Muraenosaurus* from above. *pu*, pubis; *is*, ischium; *il*, ilium; *f*, femur. About  $\frac{1}{17}$  nat. size.

locking forwards for union with the pubes, a middle, looking outwards, forming the median portion of the acetabulum, and a posterior, looking upwards and backwards, for the ilium.

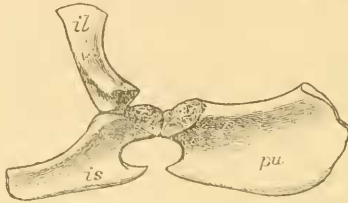
The ventral expanded portion measures 21 centim. at the widest place; the median border is slightly curved and bears the impress of the cartilage which still separated the two bones; these also made an angle of about  $120^\circ$  with one another. The symphysis of the pubes and ischia forms a curved line, convex dorsally. Each obturator foramen (if closed) was oval, the shorter axis (antero-posterior) measuring 10 centim., the longer 12.

The *ilium* (*il*) is a slightly curved, stout, rod-like bone 18.5 centim. long. Its lower end is stout and massive and bears two articular surfaces, one for union with the ischium, the other forming the hindermost portion of the acetabulum\*.

\* The separation of the ilium from the pubis in *Muraenosaurus* has been pointed out by Seeley (Proc. Roy. Soc. vol. li. (1892) p. 137); the same arrangement is described by Cragin in *Trinacromerum* ('American Geologist,' vol. viii. (1891) p. 174), and is also shown in Conybeare's restoration of the pelvic girdle of *Plesiosaurus dolichodeirus* (Trans. Geol. Soc. ser. 2, vol. i. (1824) pl. xlix. fig. 4). It also occurs in *Pliosaurus*, *Peloneustes*, and *Cryptoclidus*, and, indeed, is probably universal among the Plesiosauria.

The middle of the bone is rounded and measures 9·5 centim. in circumference; its upper portion is compressed laterally, so that it is only about 1 centim. thick; its greatest width is

Fig. 3.



Pelvic girdle of *Murænosaurus* from the side. *pu*, pubis; *is*, ischium; *il*, ilium. About  $\frac{1}{11}$  nat. size.

5·7 centim.; the upper border is curved and bears a groove for cartilage. The inner surface bears scarcely any trace of its junction with the sacral ribs, and the connexion with the vertebræ must have been a very slight one, the whole pelvis having been held firm chiefly by the greatly expanded pubes. The distance between the upper ends of the ilia is about 13 centim.

The dimensions of the associated femora are:—

	centim.
Length .....	28
Circumference of shaft at the narrowest point .....	18
Width of distal end .....	16

Numerous cervical vertebræ, as well as some dorsals and caudals of the same individual, are preserved in the collection.

LIX.—*Description of a supposed new Species of Land-Mollusk of the Genus Parmarion from Pulo Laut, an Island off the South-east Coast of Borneo.* By Lieut.-Col. H. H. GODWIN-AUSTEN, F.R.S., F.Z.S., &c.

[Plate XIX.]

IN a collection of land-shells preserved in spirit, collected by Mr. William Doherty, of Cincinnati, in the islands of the Malay Archipelago, I found two specimens of a slug-like form from Pulo Laut, the island off the south-east coast of Borneo. I hasten to describe it, having early this year, in conjunction with Mr. Walter E. Collinge, published a paper